Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently amended) A method of generating authentication data for authenticating a physical object~~,~~; the method comprising acts of:

measuring the object to generate a property set ~~Y~~ of the object using a measurement procedure;

defining criteria;

creating a robust property set ~~I~~ of the object from the measured property set ~~Y~~ that meet a predetermined robustness criterion;

creating a reduced property set ~~A~~ from the robust property set, the robust property set ~~I that~~ includes less information on the actual properties of the object than the measured property set ~~Y~~, wherein the criteria guides the creating acts ~~are guided by a criteria~~;

generating a control value ~~V~~ in dependence on properties of the reduced property set ~~A~~; and

storing the authentication data including the control value ~~V~~ and the criteria that guides the creating acts together ~~as the generated authentication data to~~ on a storage device,

wherein the criteria that is stored as a portion of the authentication data is not a member of property sets utilized for generating the stored control value ~~V~~ and the criteria

that is stored as a portion of the authentication data is used for generating an authentication control value that is compared to the stored control value for authenticating the object.

2. (Currently amended) The method as claimed in claim 1, wherein the act of creating the reduced property set ~~A~~ includes performing a contracting transformation that transforms given ranges of input properties to corresponding output values guided by the criteria.

3. (Previously presented) The method as claimed in claim 2, wherein the contracting transformation transforms a property to a binary number representative of whether the property has a positive or negative value.

4. (Currently amended) The method as claimed in claim 1, wherein the act of creating the reduced property set ~~A~~ includes an act of selecting only a subset of the robust property set ~~I~~ guided by the criteria.

5. (Currently amended) The method as claimed in claim 4, ~~including an~~the act of ~~creating~~ defining the criteria ~~for controlling the selection of the subset of the robust property set~~comprising an act of defining the criteria based on properties of the property set.

6. (Currently amended) The method as claimed in claim 5, ~~including an~~the act of ~~creating~~ defining criteria comprises acts of defining criteria based on respective authentication

applications, wherein different respective authentication applications have different defined unique criteria.

7. (Currently amended) The method as described in claim 1, wherein ~~the predetermined robustness criterion is based on a signal-to-noise ratio of the measured properties and~~ the act of creating the robust property set ~~I~~ includes an act of performing a transformation ~~F~~ on the property set ~~Y~~ to create ~~two~~ disjunct first and second robust property sets, ~~I_1 and I_2~~ where a signal to noise ratio of properties of the first robust property set I_1 are estimated to be higher than a signal to noise ratio of properties of the second robust property set, I_2, and wherein the first robust property set I_1 is used as the robust property set ~~I~~.

8. (Currently amended) The method as claimed in claim 7, wherein the transformation ~~F~~ is a linear transformation that converts a vector representing the property set ~~Y~~ to a vector with components e_i representing the robust property set ~~I~~, where each vector component e_i is independent of the other vector components ~~e_j $(j \neq i)$~~ and wherein the vector components are sorted according to an estimated signal to noise ratio.

9. (Currently amended) The method as claimed in claim 7, including the act of creating the transformation ~~F~~ in dependence on a statistical property of the measurement procedure.

10. (Currently amended) The method as claimed in claim 9, wherein the statistical property includes a covariance matrix derived from estimated properties ~~X~~ of the object and a

corresponding statistical distribution ~~F~~ determined during the measuring of the ~~property set Y~~ object.

11. (Currently amended) The method as claimed in claim 7, including an act of deriving a threshold from a noise level in the ~~measured~~ generated property set and assigning created properties with an absolute value larger than the threshold to the first robust property ~~set I_1~~.

12. (Currently amended) The method as claimed in claim 1, wherein the act of ~~creating~~ generating the control value ~~V~~ includes acts of:

converting each property of the reduced property set ~~A~~ into a binary digit, and

performing a cryptographic function on a combination of the binary digits.

13. (Previously presented) The method as claimed in claim 12, wherein the cryptographic function is a one-way function.

14. (Currently amended) A computer program stored on a computer readable persistent memory device and operative to execute on a general purpose processor for generating authentication data for authenticating a physical object, the computer program being operative to cause a processor to:

measure the object to generate a property set ~~Y~~ of the object using a measurement procedure;

create a robust property set ~~I~~ of the object from the measured property set ~~Y~~ that

meet a predetermined robustness criterion;

define criteria;

create a reduced property set ~~A~~ from the robust property set, ~~I that~~ the robust property set includes less information on the actual properties of the object than the property set ~~Y~~, wherein the criteria guides the creating acts ~~are guided by a criteria~~;

generate a control value ~~V~~ in dependence on properties of the reduced property set A; and

store the authentication data including the control value ~~V~~ and the criteria together ~~as the generated authentication data to~~ on a storage device,

wherein the criteria ~~W~~ that is stored as a portion of the authentication data that guides the creating acts is not a member of property sets utilized for generating the stored control value ~~V~~ and the criteria that is stored as a portion of the authentication data is used for generating an authentication control value that is compared to the stored control value for authenticating the object.

15. (Currently amended) A method of authenticating a physical object; the method comprising acts of:

measuring the object to generate a property set ~~Y~~ of the object using a measurement procedure;

creating a robust property set ~~I~~ of the object from the measured property set ~~Y~~ that meet a predetermined robustness criterion;

creating a reduced property set ~~A~~ from the robust property set, ~~I that~~ the robust

property set includes less information on the actual properties of the object than the property set ~~Y~~;

generating ~~a~~ an authentication control value ~~V'~~ in dependence on properties of the reduced property set ~~A~~,

retrieving from a persistent storage device authentication data including a control value ~~V~~ and ~~a~~ criteria, the authentication data is ~~that has been~~ generated for the physical object during an enrollment~~, wherein the act of retrieving comprises an act of retrieving the control value V and the criteria together from a storage device, and wherein the creating acts are~~ guided by the criteria, ~~and~~ wherein the criteria that is retrieved as a portion of the authentication data guides the creating acts and is not a member of property sets utilized for generating the retrieved and authentication control values ~~V, V'~~ and the criteria that is retrieved as a portion of the authentication data is used for generating the retrieved control value and for generating the authentication control value; and

authenticating the physical object if there is a predetermined correspondence between the generated authentication control value ~~V'~~ and the retrieved control value ~~V~~.

16. (Currently amended) A computer program stored on a computer readable persistent memory device for authenticating a physical object, the computer program being operative to cause a processor to:

measure the object to generate a property set ~~Y~~ of the object using a measurement procedure;

create a robust property set ~~I~~ of the object from the measured property set ~~Y~~ that

meet a predetermined robustness criterion;

create a reduced property set ~~A~~ from the robust property set, ~~I that~~ the robust property set includes less information on the actual properties of the object than the property set ~~Y~~;

generate ~~a~~ an authentication control value ~~V'~~ in dependence on properties of the reduced property set ~~A~~,

retrieve from a storage device authentication data including a control value ~~V~~ and a criteria, the authentication data is ~~that has been~~ generated for the physical object during an enrollment, ~~wherein the control value V and the criteria are retrieved together from a storage device, wherein the creating the property set I and the property set A are guided by the criteria, and~~ wherein the criteria that is retrieved as a portion of the authentication data is not a member of property sets utilized for generating the retrieved and authentication control values ~~V, V'~~ and the criteria that is retrieved as a portion of the authentication data is used for generating the retrieved control value and for generating the authentication control value; and

authenticate the physical object if there is a predetermined correspondence between the ~~generating a~~ generated authentication control value ~~V'~~ and the retrieved control value ~~V~~.

17. (Currently amended) A system for authenticating a physical object, ~~;~~ the system ~~including an enrollment device, an authentication device, and~~ comprising:

a storage for storing authentication data;

~~the~~ an enrollment device ~~including: an input~~ for

~~receiving~~ measuring the object to generate a property set ~~Y~~ of the object ~~measured~~ using a measurement procedure~~,~~; ~~a processor for~~

creating a robust property set ~~I~~ from the measured property set ~~Y~~ that meet a predetermined robustness criterion~~,~~;

defining criteria,

creating a reduced property set ~~A~~ from the robust property set~~,~~ ~~I that~~ the robust property set includes less information on the actual properties than the property set ~~Y~~, wherein the criteria guides the creating the robust property set ~~I~~ and the reduced property set A~~,~~ ~~are guided by a criteria; and~~

generating ~~a~~ an enrollment control value ~~V~~ in dependence on properties of the reduced property set ~~A~~ and the criteria~~,~~; and

~~an output for supplying~~ storing the authentication data including the enrollment control value ~~V~~ and the criteria ~~to~~ together on the storage ~~together as the authentication data~~; ~~and~~

~~the~~ an authentication device ~~including: an input~~ for

~~receiving a~~ measuring the object to generate an authentication property set ~~Y'~~ of the object ~~measured~~ using a measurement procedure, ~~and for~~

~~receiving~~ retrieving the authentication data including the enrollment control value ~~V~~ and the criteria together from the storage~~,~~; ~~a~~

creating ~~a~~ an authentication robust property set ~~I'~~ from the measured property set ~~Y'~~ that ~~meet~~ meets a predetermined robustness criterion~~,~~; ~~for~~

creating ~~a~~ an authentication reduced property set ~~A'~~ from the authentication robust property set, ~~I'~~ ~~that~~ the authentication robust property set includes less information on the actual properties of the object than the authentication property set ~~Y'~~, wherein criteria that is retrieved from the storage guides the creating the authentication robust property set I'-and the authentication reduced property set ~~A'~~ ~~are guided by the criteria; for~~

generating ~~a~~ an authentication control value ~~V'~~ in dependence on properties of the authentication reduced property set ~~A'~~, wherein the criteria that is retrieved from the storage as a portion of the authentication data is not a member of the property sets utilized for generating the enrollment and authentication control values ~~V, V'; and for~~ and is used for generating the retrieved enrollment control value and for generating the authentication control value,

authenticating the physical object if there is a predetermined correspondence between the ~~generated~~ retrieved authentication control value ~~V'~~ and the ~~retrieved~~ enrollment control value, ~~V;~~ and

~~an output for~~ issuing a signal indicating whether or not the physical object has been authenticated.

18. (Currently amended) An authentication device for authenticating a physical object, the authentication device comprising:

an input for receiving a property set ~~Y~~ of a physical object measured using a measurement procedure and ~~for receiving a~~ authentication data including an enrollment control value ~~V~~ and ~~a~~ criteria together from a storage;

a processor for

creating a robust property set ~~I~~ from the measured property set ~~Y~~ that ~~meet~~ meets a predetermined robustness criterion,~~;~~

~~for~~ creating a reduced property set ~~A~~ from the robust property set, ~~I that~~ the robust property set includes less information on the actual properties of the object than the property set ~~Y~~, wherein the criteria that is received as a portion of the authentication data guides the creating the robust property set ~~I~~ and the reduced property set, ~~A are guided by the criteria;~~

~~for~~ generating ~~a~~ an authentication control value ~~V'~~ in dependence on properties of the reduced property set, ~~A;~~ and

~~for~~ authenticating the physical object if there is a predetermined correspondence between the generated authentication control value ~~V'~~ and the retrieved enrollment control value ~~V~~, wherein the criteria that is received as a portion of the authentication data is not a member of the property sets utilized for generating the authentication control value ~~V'~~ and the criteria that is received as a portion of the authentication data is used for generating the enrollment control value and the authentication control value ; and

an output for issuing a signal indicating whether or not the physical object has been authenticated.

19. (New) The method as claimed in claim 1, wherein the act of creating the robust property set of the object comprises an act of adapting the criteria until the robust property

set includes a predetermined number of properties, wherein the act of storing the authentication data comprises an act of storing the adapted criteria that guides the creating acts.

20. (New) The method as claimed in claim 1, wherein the physical object includes the persistent memory device and the act of storing the authentication data comprises an act of storing the authentication data in the physical object.